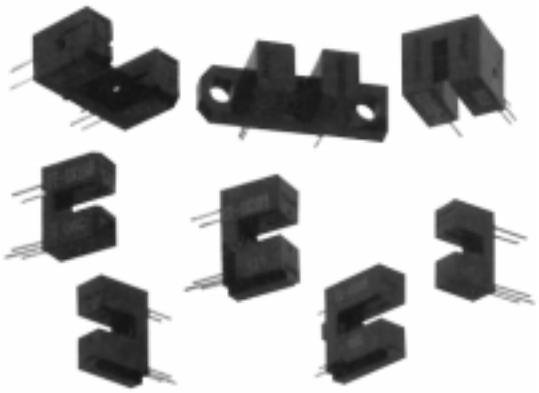
OMRON

EE-SX3□/SX4□

PCB-mount Sensors with Photo IC Output Have Built-in Preamplifier Chip and Schmitt Circuit



- Compact, lightweight model with a receiver and amplifier circuit built into a single chip
- Excellent temperature characteristics assured by receiver with a temperature compensation circuit
- Directly driving electronic circuitry with no interface
- Wide operating voltage range (4.5 to 16 VDC) makes smooth connection possible with a CMOS or TTL
- Dark-ON and Light-ON models available
- High-resolution sensing assured by the slits on the emitter and receiver panels

Ordering Information

Appearance	Sensing method	Slot width	Slot depth	Sensing object	Output configuration	Weight	**Part number**
	Transmissive	2 mm	6 mm	Opaque, 0.2 x 2.1 mm min.	Light-ON	Approx. 0.7 g	**EE-SX493**
		3 mm	7.5 mm	Opaque, 0.5 x 2.0 mm min.	Dark-ON	Approx. 0.6 g	**EE-SX398**
					Light-ON		**EE-SX498**
		3.4 mm	7.2 mm	Opaque, 0.5 x 2.1 mm min.	Dark-ON	Approx. 0.8 g	**EE-SX301**
					Light-ON		**EE-SX401**
			10 mm	Opaque, 0.5 x 2.1 mm min.	Dark-ON	Approx. 1.0 g	**EE-SX305**
					Light-ON		**EE-SX405**
		3.5 mm	5.5 mm	Opaque, 2.0 x 0.5 mm min.	Dark-ON	Approx. 0.8 g	**EE-SX384**
					Light-ON		**EE-SX484**
		8 mm	7.5 mm	Opaque, 0.5 x 2.2 mm min.	Dark-ON	Approx. 0.6 g	**EE-SX3070**
					Light-ON		**EE-SX4070**

Specifications

■ ABSOLUTE MAXIMUM RATINGS (T_A = 25°C (77°F))

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA*
	Reverse voltage	V_R	4 V
Receiver	Supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Output permissible dissipation	P_{OUT}	250 mW*
Ambient temperature	Operating	Topr	-40°C to 75°C (-40° to 167°F)
	Storage	Tstg	-40°C to 85°C (-40° to 185°F)

*Refer to Engineering Data if the ambient temperature is not within the rated temperature range.

■ RECOMMENDED OPERATING CONDITION (WITHIN THE RATED TEMPERATURE RANGE)

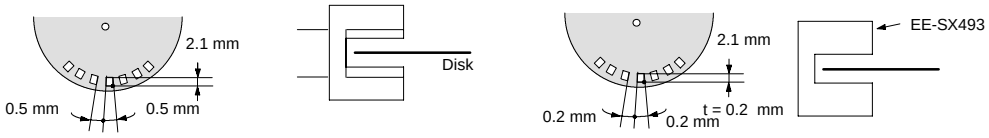
Item	Symbol	Recommended value	Remarks
Supply voltage	V_{CC}	4.5 to 16 V	—
Output voltage	V_{OUT}	4.5 to 28 V	—
Output current	I_{OUT}	16 mA max.	—
LED current	I_F	15 mA	V_{CC} = 4.5 to 16 V

■ CHARACTERISTICS (T_A = 25°C (77°F))

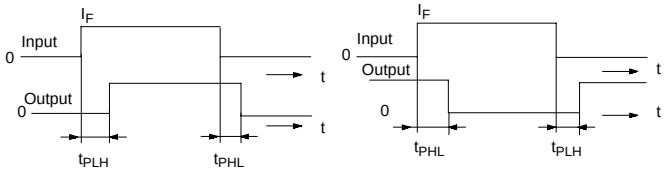
Item		Symbol	EE-SX301/401/305/405/384/484		EE-SX493		EE-SX398/498		EE-SX3070/4070	
			Value	Condition	Value	Condition	Value	Condition	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ. 1.5 V max.	I_F = 20 mA	1.2 V typ. 1.5 V max.	I_F = 20 mA	1.2 V typ. 1.5 V max.	I_F = 20 mA	1.2 V typ. 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ. 10 μA max.	V_R = 4 V	0.01 μA typ. 10 μA max.	V_R = 4 V	0.01 μA typ. 10 μA max.	V_R = 4 V	0.01 μA typ. 10 μA max.	V_R = 4 V
Receiver	Low level output voltage	V_{OL}	0.12 V typ. 0.4 V max.	V_{CC} = 4.5 to 16 V I_{OL} = 16 mA	0.12 V typ. 0.4 V max.	V_{CC} = 4.5 to 16 V I_{OL} = 16 mA	0.12 V typ. 0.4 V max.	V_{CC} = 4.5 to 16 V I_{OL} = 16 mA	0.12 V typ. 0.40 V max..	V_{CC} = 5 to 16 V I_{OL} = 16 mA
	High level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V R_L = 1 kΩ	15 V min.	V_{CC} = 16 V R_L = 1 kΩ	15 V min.	V_{CC} = 16 V R_L = 1 kΩ	15 V min.	V_{CC} = 16 V R_L = 1 kΩ
	Current consumption	I_{CC}	3.2 mA typ. 10 mA max.	V_{CC} = 16 V	3.2 mA typ. 10 mA max.	V_{CC} = 16 V	3.2 mA typ. 10 mA max.	V_{CC} = 16 V	3.2 mA typ. 10 mA max.	V_{CC} = 16 V

Item		Symbol	EE-SX301/401/305/405/384/484		EE-SX493		EE-SX398/498		EE-SX3070/4070	
Combination	LED current when output is OFF	I_{FT}	3 mA typ. 8 mA max.	V_{CC} = 4.5 to 16 V	10 mA typ. 15 mA max.	V_{CC} = 4.5 to 16 V	2 mA typ. 5 mA max.	V_{CC} = 4.5 to 16 V	10 mA max.	V_{CC} = 4.5 to 16 V
	LED current when output is ON									
	Hysteresis	ΔH*	15% typ.	V_{CC} = 4.5 to 16 V	15% typ.	V_{CC} = 4.5 to 16 V	15% typ.	V_{CC} = 4.5 to 16 V	15% typ.	V_{CC} = 5 to 16 V
	Response frequency	f	3000 P.P.S min.**	V_{CC} = 4.5 to 16 V I_F = 15 mA I_{OL} = 16 mA	3000 P.P.S min.**	V_{CC} = 4.5 to 16 V I_F = 15 mA I_{OL} = 16 mA	3000 P.P.S min.**	V_{CC} = 4.5 to 16 V I_F = 15 mA I_{OL} = 16 mA	3000 P.P.S min.**	V_{CC} = 5 to 16 V I_F = 15 mA I_{OL} = 16 mA
	Response delay time	t_{PLH} (t_{PHL})***	3 µs typ.		3 µs typ.		3 µs typ.		3 µs typ.	
		t_{PHL} (t_{PLH})***	20 µs typ.		20 µs typ.		20 µs typ.		20 µs typ.	

*Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned ON and when the photo IC is turned OFF.
**The value of the response frequency is measured by rotating the disk as shown below.



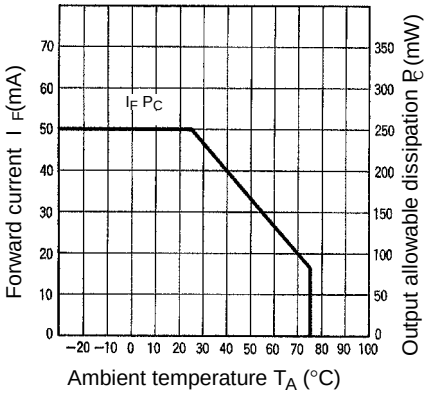
***The following illustrations show the definition of response delay time.



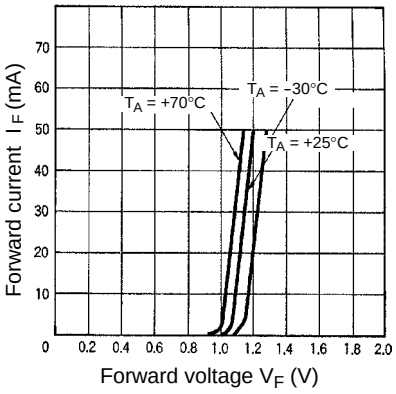
Engineering Data

Note: 1. The operating conditions of the photomicrosensor must be within the absolute maximum rating ranges.
2. Data in parentheses apply to the EE-SX4□.

■ TEMPERATURE CHARACTERISTICS (TYPICAL)

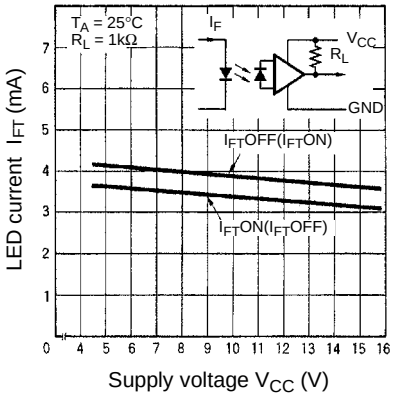


■ INPUT CHARACTERISTICS (TYPICAL)

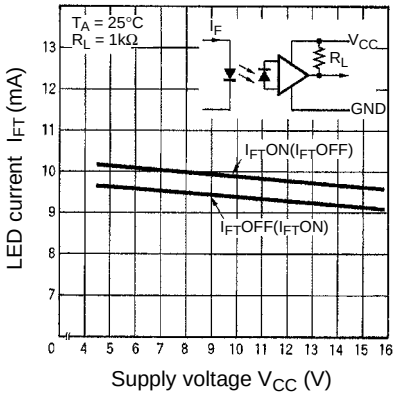


■ LED CURRENT VS. SUPPLY VOLTAGE (TYPICAL)

EE-SX3070/4070

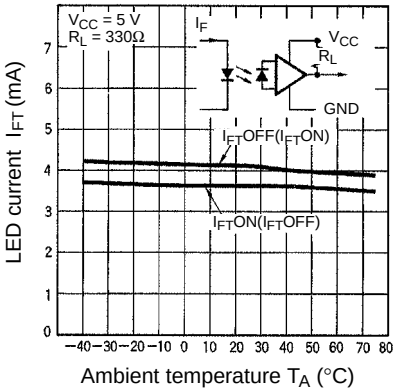


EE-SX493

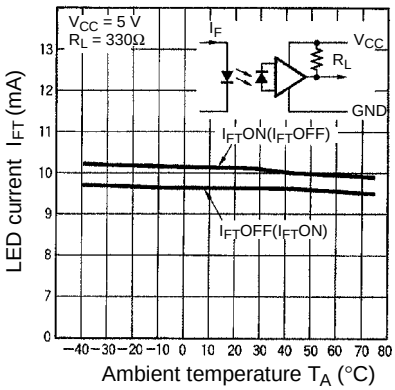


■ LED CURRENT VS. AMBIENT TEMPERATURE DEPENDENCY (TYPICAL)

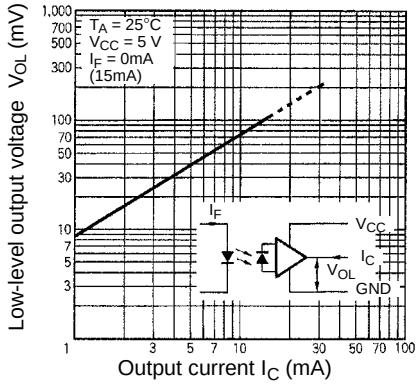
EE-SX3070/4070



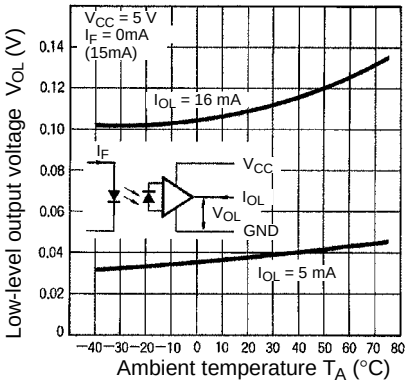
EE-SX493



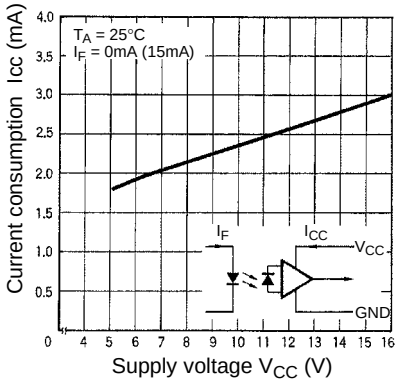
■ LOW LEVEL OUTPUT VOLTAGE VS. OUTPUT CURRENT (TYPICAL)



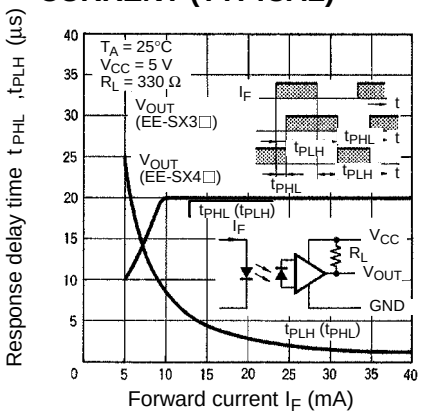
■ LOW LEVEL OUTPUT VOLTAGE VS. TEMPERATURE (TYPICAL)



■ CURRENT CONSUMPTION VS. SUPPLY VOLTAGE (TYPICAL)

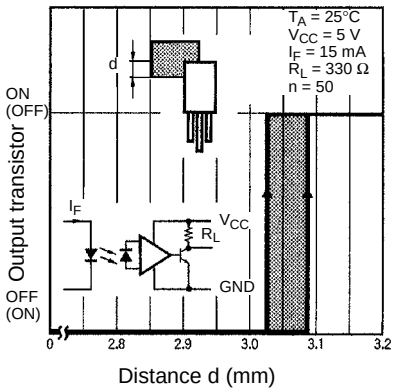


■ RESPONSE DELAY TIME VS. FORWARD CURRENT (TYPICAL)

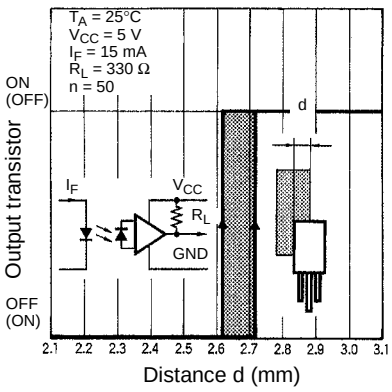


■ DISTRIBUTION OF SENSING POSITION CHARACTERISTICS (TYPICAL)

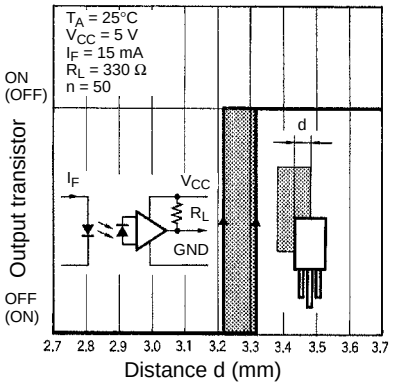
EE-SX493



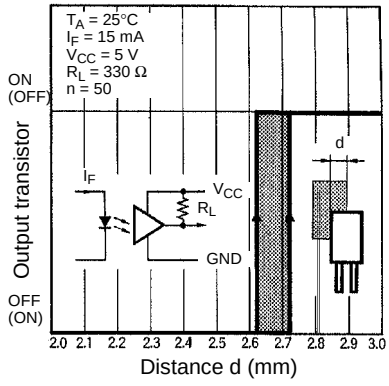
EE-SX398/498



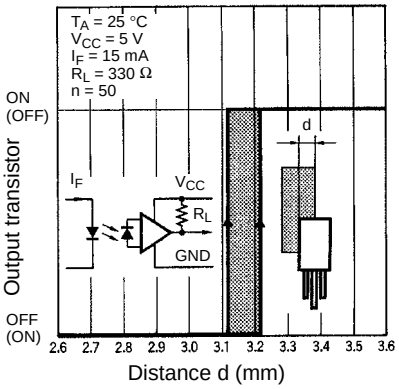
EE-SX301/305/401/405



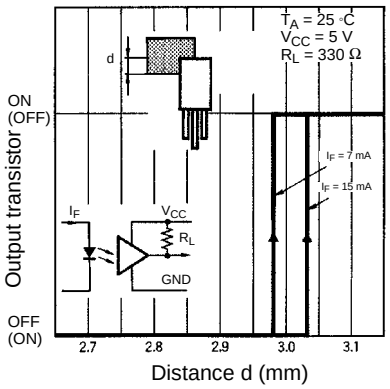
EE-SX384/484



EE-SX3070/4070

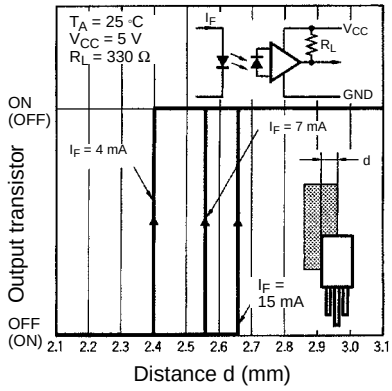


EE-SX493

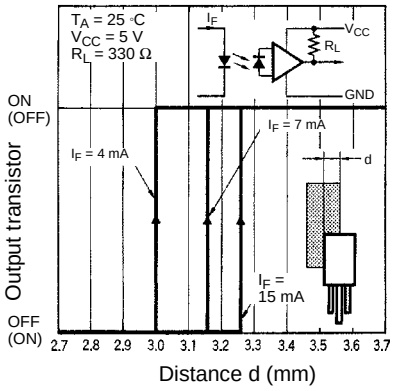


■ DEPENDENCY OF SENSING POSITION ON FORWARD CURRENT (TYPICAL)

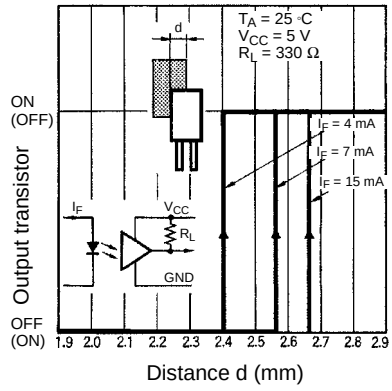
EE-SX398/498



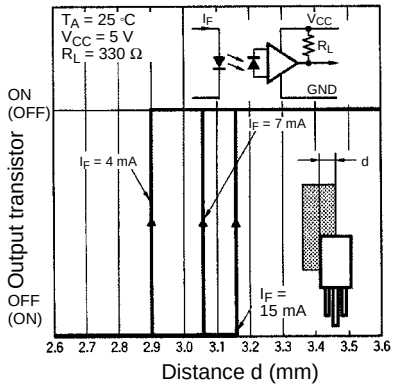
EE-SX301/305/401/405



EE-SX384/484

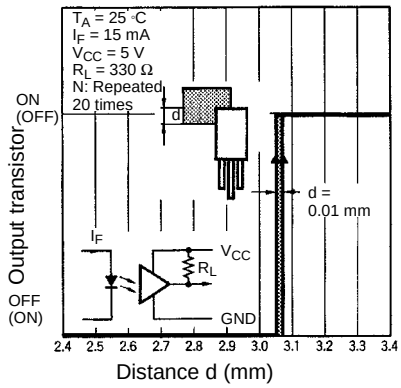


EE-SX3070/4070

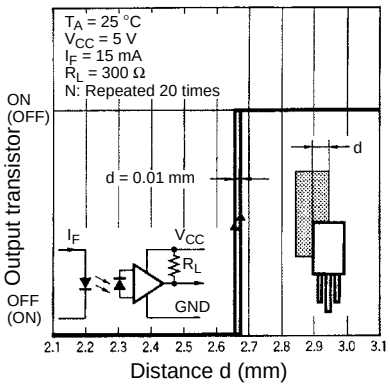


■ REPEATED SENSING POSITION CHARACTERISTICS (TYPICAL)

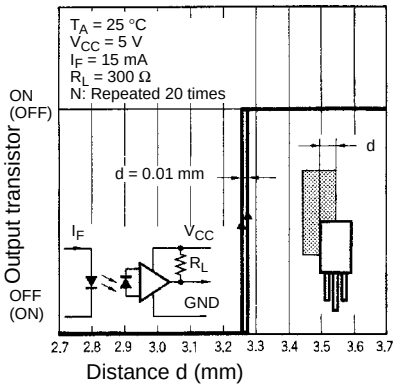
EE-SX493



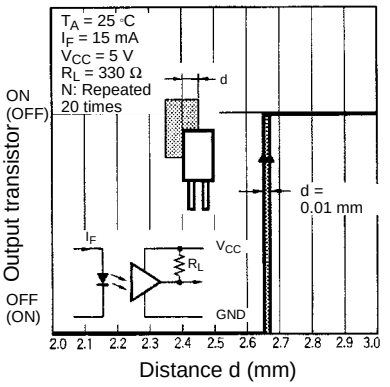
EE-SX398/498



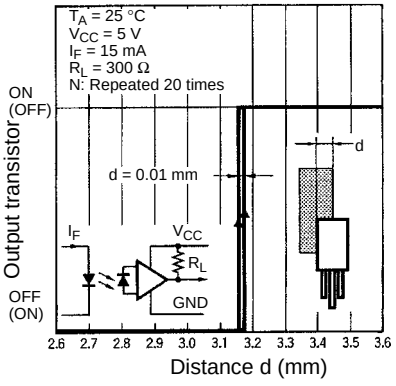
EE-SX301/305/401/405



EE-SX398/484



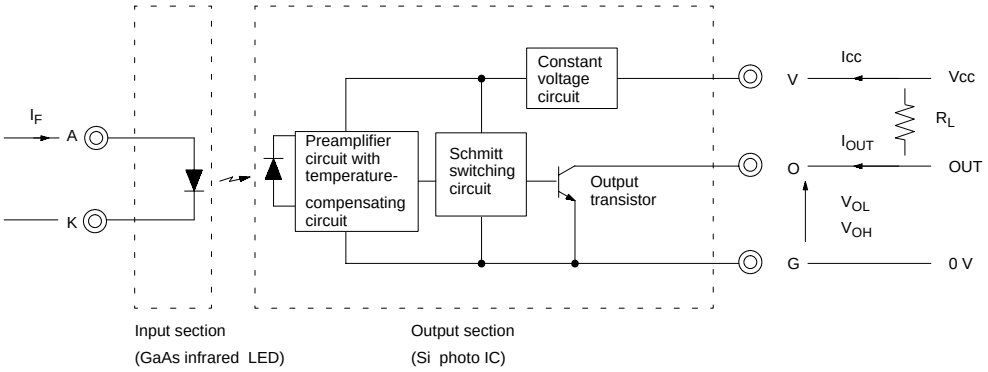
EE-SX3070/4070



Operation

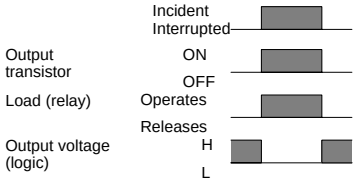
■ INTERNAL CIRCUIT DIAGRAM

Light-ON/Dark-ON

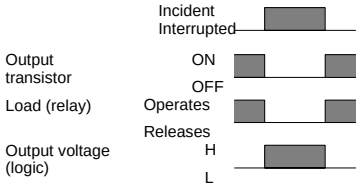


■ TIMING CHART

Light-ON



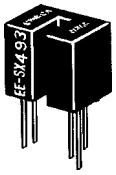
Dark-ON

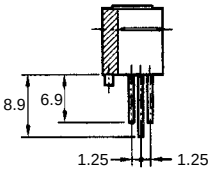


Dimensions

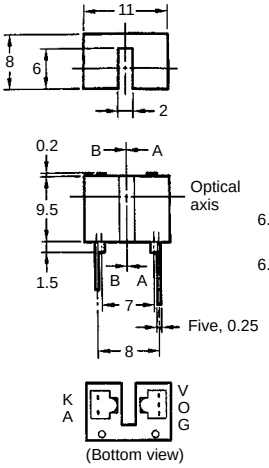
Unit: mm (inch)

■ EE-SX493

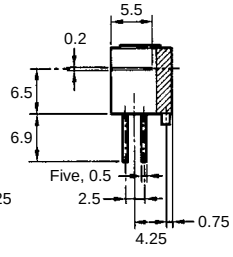




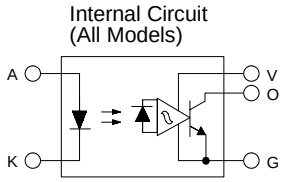
Cross section BB



(Bottom view)

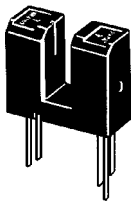


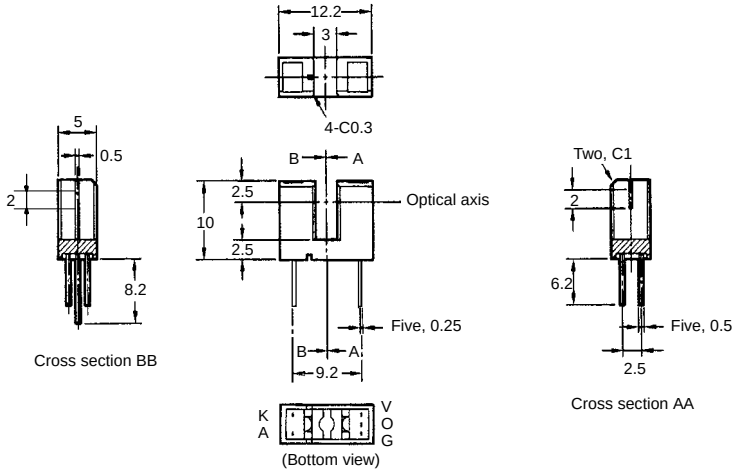
Cross section AA



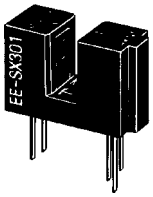
Terminal N0.	Name
A	Anode
K	Cathode
V	Supply Voltage (V_{CC})
O	Output (OUT)
G	Ground (GND)

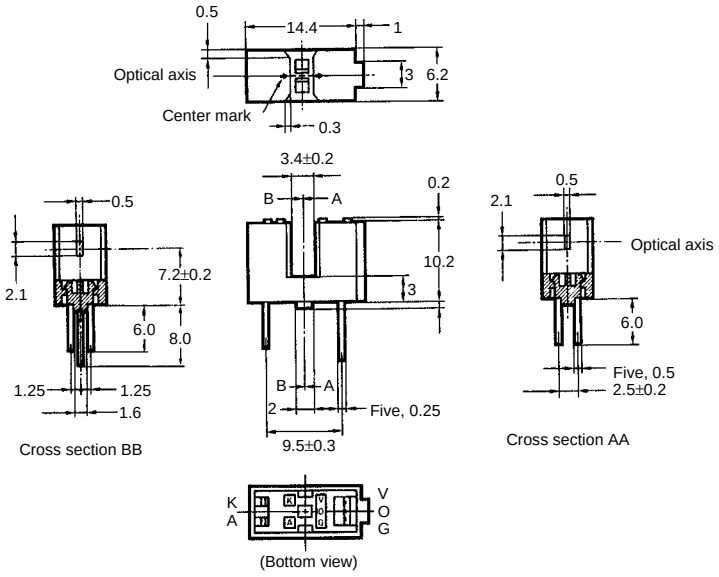
■ EE-SX398/498



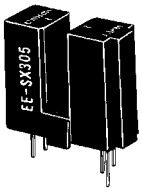


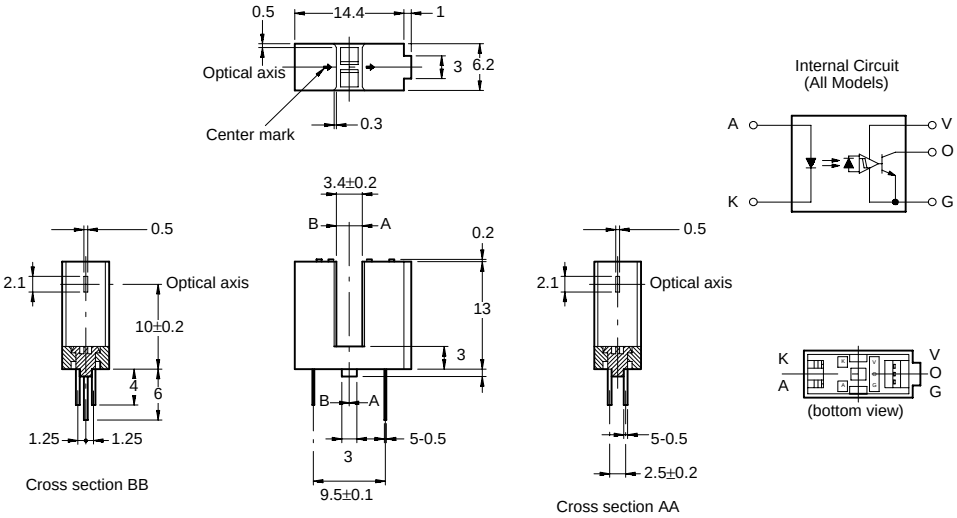
■ EE-SX301/401



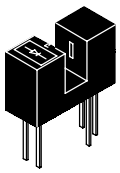


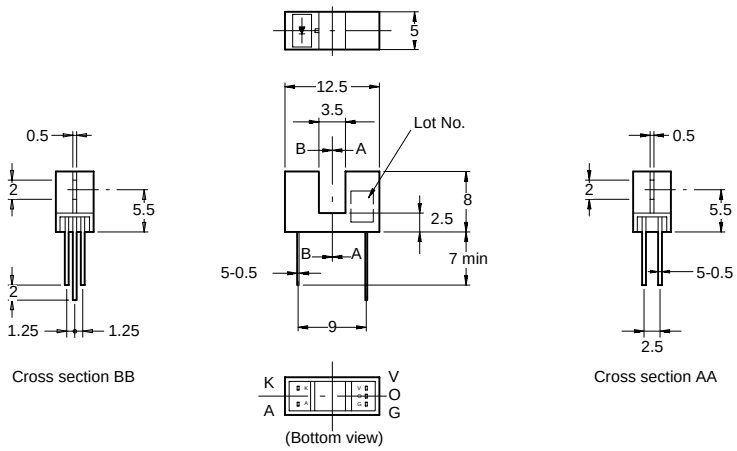
■ EE-SX305/405





■ EE-SX384/484





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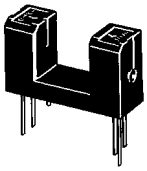

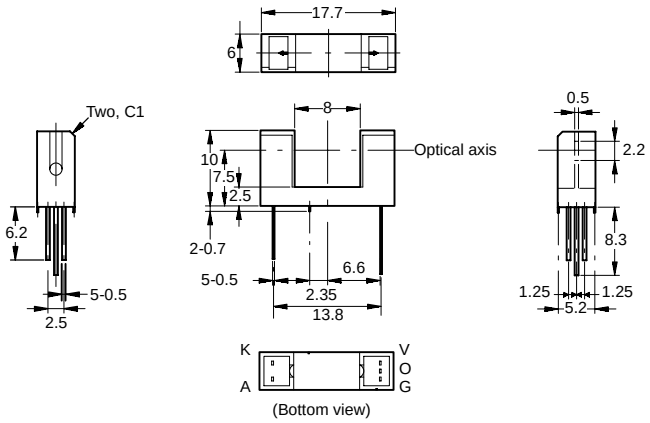

Precautions

Refer the Technical Information section for general precautions.

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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